UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
BIN C15700
Seattle, WA 98115-0070

April 3, 2002

Greg Pratschner
U.S. Fish and Wildlife Service
Leavenworth National Fish Hatchery Complex
12790 Fish Hatchery Road
Leavenworth, Washington 98826

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation for the Icicle Creek Restoration Project, Leavenworth National Fish Hatchery, Leavenworth, Chelan County, Washington (NMFS No. WSB-01-300)

Dear Mr. Pratschner:

The attached document transmits the National Marine Fisheries Service's (NMFS) Biological Opinion (BO) on the proposed Icicle Creek Restoration Project in the historic Icicle Creek channel in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.)*. The U.S. Fish and Wildlife Service had determined that the proposed actions are likely to adversely affect the Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) and UCR spring chinook salmon (*O. tshawytscha*) Evolutionarily Significant Units (ESU). Formal consultation was initiated for this project on August 17, 2001.

This BO reflects formal consultation and an analysis of effects covering the UCR steelhead and UCR spring chinook salmon in the historic Icicle Creek channel adjacent to the Leavenworth National Fish Hatchery. The BO is based on information provided in the July 2, 2001 biological assessment and June 2001 Icicle Creek Restoration Project Draft Environmental Impact Statement sent to NMFS by the U.S. Fish and Wildlife Service. A complete administrative record of this consultation is on file at the Washington State Habitat Branch Office.

The NMFS concludes that implementation of the proposed projects is not likely to jeopardize the continued existence of UCR steelhead or UCR spring chinook salmon or result in the destruction or adverse modification modification of their critical habitat. In your review, please note that the incidental take statement, which includes reasonable and prudent measures and terms and conditions, was designed to minimize take.

This BO also serves as consultation on Essential Fish Habitat pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations at 50 CFR Part 600.

If you have any questions, please contact Dennis Carlson of the Washington Habitat Branch Office at (360) 753-5828.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION

and

Magnuson-Stevens Fishery Conservation Management Act Consultation

Icicle Creek Restoration Project
NMFS No. WSB-01-300

Agency: U.S. Fish and Wildlife Service

Consultation
Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch

Approved: F.r Michael R Crouse
D. Robert Lohn
Regional Administrator

Date: 04/03/2002

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1.0 INTRODUCTION

1.1 Background and Consultation History

On July 3, 2001, the National Marine Fisheries Service (NMFS) received a Biological Assessment (BA) from the U.S. Fish and Wildlife Service (USFWS), Mid-Columbia River Fishery Office, Leavenworth, Chelan County, Washington. On August 17, 2001, the USFWS submitted a request to initiate section 7 consultation for their proposal to restore both fish passage and riverine habitat in Icicle Creek within the Leavenworth National Fish Hatchery compound. That BA did not address instream flow requirements for anadromous fish in Icicle Creek. Instead, the instream flow habitat component will be the subject of a future BA submitted by the USFWS for section 7 consultation. On December 21, 2001, the NMFS received an amended BA from the USFWS that modified their original work proposal.

Several government agencies and members of the public have suggested to the USFWS that they remove all in-stream structures and accumulated sediment from the historic Icicle Creek channel and abandon the existing manmade canal. The USFWS developed an alternative that recognized concerns about stream dynamics, historic values, water quality, and the tribal fishery. That alternative proposed the removal of most in-channel structures and promoted mechanical dredging of accumulated channel sediment. Since then, that alternative was amended to allow the Icicle Creek historic channel to naturally scour accumulated sediments instead of performing mechanical dredging.

When the Leavenworth National Fish Hatchery was constructed in 1939-1941, a one mile stretch of creek channel was used for holding and spawning returning fish. A series of dams and weirs were installed in the channel to create ponds to hold salmonids prior to annual spawning. Hatchery operations were conducted within the creek. It was operationally critical that flow into the channel be controlled. A headgate dam was constructed at the upstream end of the original channel (historic channel) to control flows into it. Fish migration to areas above the hatchery was blocked by the series of dams and weirs in the historic channel and a spillway dam at the base of the canal.

A fish ladder and two holding ponds were constructed at the base of the canal spillway to collect the returning hatchery broodstock. These are still operating today. After 60 years of operating the headgate to limit flows in the historic channel, sediments have accumulated and have created large, delta-like deposits. The channel has evolved from riverine to wetland habitat. The channel has reduced in dimensions and wetlands have developed on encroaching sediment deposits. This portion of the creek no longer provides suitable fish habitat (USFWS 2001). Presently neither use of the former holding areas, nor blockage of upstream fish passage is required for operation of the hatchery. However, the headgate at Structure No. 2 is presently used for flow control. Migration of resident and anadromous fish is affected by stream blockage at the hatchery.

The USFWS has determined that the proposed action will occur within the evolutionarily significant unit (ESU) and critical habitat of endangered Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*) and endangered UCR spring chinook salmon (*O. tshawytscha*). The USFWS also determined that the proposed actions were likely to adversely affect both UCR steelhead and spring chinook salmon.

This BO reflects the results of the formal consultation process. Formal consultation involves correspondence and communication between NMFS and the lead action agency to supplement and clarify the information contained within the BAs. A summary of key events is provided below.

- Receipt of the BA from the USFWS on July 3, 2001.
- Receipt of a cover letter requesting section 7 consultation on August 17, 2001.
- Resend (by fax) copy of the BA dated July 2, 2001 on September 27, 2001.
- Receipt of the amended BA from the USFWS on December 21, 2001.

In addition to the above, several telephone conversations have occurred between Malenna Cappellini (USFWS) and Dennis Carlson (NMFS) regarding the project proposal and information contained in the BAs. Informal project discussions between the USFWS and NMFS staff have also been conducted over the last two years.

1.2 Description of the Proposed Action

USFWS proposes to complete restoration projects in Icicle Creek at Leavenworth National Fish Hatchery. The underlying projects include construction activities to remove Structure No. 3 and Structure No. 4, including any diffusion dams, racks, abutments, flumes, and concrete foundations. The manmade bypass canal would be retained. Structure No. 2 would be retained in its entirety (includes two rack structures below the headgate) as both a flow control structure and a representative display of the historic structures originally constructed at the hatchery. All parts of Structure No. 2 would be reconditioned. A vertical slot fishway would be constructed at the headgate to provide fish passage. The fishway would be designed to allow passage of all life stages of salmonids and the operational needs of the sight. The headgate would continue to be operated as a flow control structure. Flows would be limited to a maximum of 2,620 cubic feet per second (cfs). During the spring collection, May 1 to July 31, flow into the historic channel would be limited to allow more flow into the canal to maintain the effectiveness of Leavenworth National Fish Hatchery's adult return fish ladder and the tribal fishery. However, the effectiveness of the vertical slot fishway at Structure No. 2 would be maintained during this time period.

Structure No. 5 would be modified so that it could be operated as a seasonal "hatchery fish" barrier while allowing upstream and downstream passage of non-hatchery fish. It would also allow sediment to pass. Modification would include removing all stop logs and boards and installing three hydraulic V-trap style pickets (one oriented for downstream migrating fish and two oriented for upstream migration) and two sorting facilities. The V-trap pickets would only be in place during the spring collection season. Outside of the collection season, fish passage would be unhindered through Structure No. 5.

During the spring collection season, fish would be allowed to pass downstream past Structure No. 5 via a large V-shaped picket. Fish moving downstream would be guided along the picket panels to a pair of openings near the center of the stream. The angled nature of the pickets would help to guide fish downstream to the openings, thus reducing the delay in downstream passage while simultaneously thwarting upstream passage. The picket barrier would be installed across the center of the channel immediately downstream of Structure No. 5. A concrete sill would be constructed in the streambed in which to seasonally install the pickets and panels. Fish moving upstream would encounter the center V-picket barrier and be guided towards V-pickets installed at the fishways on the left (south) and right (north) streambanks. Upon entering a fishway and V-picket, they would be unable to move back out. Both natural and hatchery fish entering the fishway would be trapped and held. Those fish would be sorted through a steep-pass Denil style ladder with false weirs and sorting flumes installed at the fishways. Non-hatchery fish would be placed upstream of Structure No. 5 and hatchery spring chinook would be returned downstream. This sorting system requires a minimal amount of hatchery staff and fish handling. The frequency and duration with which this sorting occurs would be dependent upon the number of fish entering the fishway, the amount of stress and delay allowable for upstream migrating fish, and the rate at which the fish respond to the activation of the Denil ladder.

A walking excavator would be used for the in-channel construction work. All equipment access would be from existing roads. Sediments that have accumulated in the historic channel would be flushed through the project area when up to a maximum of 2,620 cfs instream flow is reintroduced at project completion. Any vegetation removed during project work would be transplanted to other areas of the hatchery grounds as much as practicable.

Fish passage is provided through the historic channel by modifying Structure No. 5 and constructing a vertical slot fishway at the Structure No. 2 headgate. All threatened and endangered fish that inadvertently enter the hatchery's adult return ladder, instead of migrating upstream through the historic channel, would be captured and trucked upstream of the project area.

Project work would begin July 31 and take up to one year to complete. All instream work would be conducted with timing restrictions to avoid fish spawning and egg incubation periods.

For instream work conducted in the historic creek channel, the channel would be dried up after July 31 and would remain dry until project completion. During that time the headgate would be closed and the entire stream flow would be directed down the canal. Several measures would be

taken to reduce fish stranding in the historic channel as it is dried up. The channel would be snorkeled and walked to inventory fish presence before dewatering the channel. Channel flow would then be reduced in a two step process. As channel flow is reduced fish would be dipnetted and electrofished (if necessary) to remove all fish from the work area. Monitoring for stranded fish would continue as the channel would go dry. All captured fish would be safely transported and released to the main creek channel immediately downstream of the hatchery. All flow to the channel will be cut off after capture and release of any remaining fish. Once the historic channel is dry large equipment would enter as necessary to break up and remove the concrete and steel structures to be hauled by truck from the site. Heavy equipment would also be used to construct the new structures (i.e., the new vertical slot at Structure No. 2 headgate) and recondition structures that will remain temporarily or permanently. After project completion, the headgate would be reopened and flow restored to the channel.

A streambank restoration project was completed in 1998 by the USFWS immediately downstream from the hatchery property. The instream structures in that project were designed to function with the majority of stream flow entering the area from the canal. If flows in the historic channel are increased as proposed in this biological opinion (BO), the existing project would not function properly. Instream structures such as barbs, J-hook veins, or vortex rock weirs may be placed on the left bank of the historic channel below Structure No. 5 near the confluence with the main channel. Those structures would reduce streambank shear stress by directing flows away from the left bank towards the middle of the main channel. An additional 1,400 linear feet of streambank would be replanted with native riparian vegetation.

Where flow in the historic channel is increased, flow velocities against the outside meander bend on the right bank between Structures No. 4 and 5 would increase stress on the streambank and cause erosion and instability in the historic channel. Instream barbs, J-hook veins, or vortex rock weirs would be constructed to protect the bank from erosion. Additional proposed work would include the installation of instream structures and grade control weirs to slow or stop head cutting in an overflow meander channel that begins between Structures No. 4 and 5 on the right bank of the historic channel.

2.0 ENDANGERED SPECIES ACT

The Endangered Species Act (ESA) (16 USC 1531-1544), amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat on which they depend. Section 7(a)(2) of the ESA requires federal agencies to consult with USFWS and NMFS, as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats. This BO is the product of an interagency consultation pursuant to Section 7(a)(2) of the ESA and implementing regulations found at 50 CFR Part 402.

2.1 Biological Opinion

The objective of this consultation is to determine whether the proposed historic channel flushing, maintenance of certain existing instream structures, and the construction of instream barbs, J-hook vanes, or vortex rock weirs is likely to jeopardize the continued existence of UCR steelhead or UCR spring chinook salmon or result in the destruction or adverse modification of their critical habitat.

2.1.1 Status of the Species and Critical Habitat

2.1.1.1 UCR Steelhead

UCR steelhead were listed as endangered species under the ESA on August 18, 1997 (62 Fed. Reg. 43937). Critical habitat for the UCR steelhead was designated on February 16, 2000 (65 fed. Reg. 7764; February 16, 2000). The listing status, biological information, and other information for the UCR steelhead is further described in Attachment 1.

Range-wide factors for the decline of west coast steelhead stocks are primarily attributed to the destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors (NMFS 1996a, 1996b, 1997). Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes (including the Columbia River Basin) have greatly reduced or eliminated historically accessible habitat. Studies estimate that during the last 200 years, the lower 48 states have lost approximately 53% of all wetlands and the majority of the rest are severely degraded (Gregory & Bisson 1997). Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91% loss of its wetland habitat (NRC 1996).

Loss of habitat complexity has also contributed to range-wide decline of steelhead. In portions of some national forests in Washington, there has been a 58% reduction in large deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood (McIntosh et al., 1994). Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast steelhead (62 Fed. Reg. 43942).

Steelhead of this listed ESU that are likely to be adversely affected by the proposed action range in the Wenatchee River and its tributaries, including Icicle Creek. The UCR Basin steelhead ESU occupies the Columbia River Basin upstream from the confluence with the Yakima River, Washington, to the United States-Canada border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion (Omernik 1987). The Wenatchee and Entiat Rivers are in the Northern Cascades Physiographic Province. The river valleys in this region are deeply dissected and maintain low gradients except in extreme headwaters. The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Streamflow in this area is provided by melting snowpack, groundwater, and runoff from alpine glaciers.

The proposed action would occur within designated critical habitat for UCR steelhead. Defining specific stream reaches that are critical for steelhead is difficult because of the low abundance of the species and of our imperfect understanding of the species' freshwater distribution, both current and historical (65 Fed. Reg. 7764: February 16, 2000). Based on consideration of the preferred approach to identifying critical habitat for steelhead is to designate all areas accessible to the species within the range of specified river basins in this ESU (65 Fed. Reg. 7764: February 16, 2000).

Essential features of steelhead critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. Good summaries of the environmental parameters and freshwater factors have contributed to the decline of steelhead can be found in reviews by Pauley et al., (1986); NMFS (1996); NMFS (1996a, 1996b, 1997); and Spence et al., (1996).

Estimates of historical (pre-1960s) steelhead abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size in excess of 5,000 adults for tributaries above Rock Island Dam (Chapman et al., 1994). Recent five-year (1989-1993) average natural escapements for the Wenatchee River were 800 steelhead. Recent average total escapements for this stock was 2,500 (62 Fed. Reg. 43949; August 18, 1997).

Steelhead in the Upper Columbia River ESU continue to exhibit low abundances, both in absolute numbers and in relation to numbers of hatchery fish throughout the region. Review of the most recent data indicates that natural steelhead abundance has declined or remained low and relatively constant in the major river basins in this ESU (Wenatchee, Methow, Okanogan) since the early 1990s (NMFS 1996a, 1996b, 1997). Estimates of natural production of steelhead in the ESU are well below replacement (approximately 0.3:1 adult replacement ratios estimated in the Wenatchee and Entiat rivers) (62 Fed. Reg. 43949; August 18, 1997). These data indicate that natural steelhead populations in the Upper Columbia River Basin are not self-sustaining at the present time. There is also anecdotal evidence that resident rainbow trout contribute to anadromous run abundance. This phenomenon would reduce estimates of the natural steelhead replacement ratio (62 Fed. Reg. 43949; August 18, 1997).

The primary cause for concern for steelhead in this ESU is the extremely low estimate of adult replacement rate. The dramatic declines in natural run sizes and inability of naturally spawning steelhead adults to replace themselves suggest that if present trends continue, this ESU will not be viable (62 Fed. Reg. 43950; August 18, 1997).

Evidence suggests that historically Icicle Creek produced wild steelhead (Mullan et al., 1992). However, the present population size of wild steelhead native to this creek is unknown. Leavenworth National Fish Hatchery raised summer steelhead from 1940-1951 and from 1977-1995 with the last release in 1997 (USFWS BA, 2001). The brood stock for the program was collected at Rock Island Dam and in low return years, supplemental eggs from Wells State Fish hatchery were used. The program was ended at Leavenworth National Fish Hatchery and moved

to Winthrop National Fish Hatchery because of an inadequate water supply, low adult returns, and concern over using non-Wenatchee River stocks (USFWS 1998 *as cited in* USFWS BA, 2001). All hatchery produced steelhead since 1986 have been marked by adipose fin clipping before release. The percentage of wild steelhead in the adult returns to Leavenworth National Fish Hatchery for the years 1987, 1988, 1991, and 1993 averaged 21% (range = 4 - 41%) (USFWS 1998 *as cited in* USFWS 2001). In 1999 and 2000, thirty-two and twenty-three steelhead, respectively, were captured in the ladder at the Leavenworth National Fish Hatchery. Four (1999) and one (2000) of these were not adipose fin clipped and may have been wild steelhead (USFWS BA, 2001). In 2000, the Washington Department of Fish and Wildlife conducted a steelhead spawning ground survey from March 3rd to May 20th in lower Icicle Creek. Twenty redds and twenty adults were observed with an estimated total number of adult steelhead ranging from 40 to 50 (USFWS BA, 2001).

2.1.1.2 UCR Spring Chinook

The UCR spring chinook salmon ESU was listed as endangered pursuant to the ESA on March 24, 1999 (64 Fed. Reg. 14308). Critical habitat for the UCR spring chinook salmon was designated on February 16, 2000 (65 Fed. Reg. 7764). The listing status, biological information, and other information for the UCR spring chinook salmon are further described in Attachment 2.

The species status reviews (NMFS 1998a, 1998b) cited references indicating that habitat degradation is the major cause for the range-wide decline in west coast chinook stocks. Habitat alterations that have affected chinook salmon include water withdrawal, conveyance, storage, flood control (resulting in insufficient flows, stranding, juvenile entrainment, and increased stream temperature temperatures), logging and agriculture (resulting in loss of large woody debris, sedimentation, loss of riparian vegetation, and habitat simplification) (Spence et al., 1996: NMFS 1998a). Dams, mining, and urbanization have also contributed to the partial depletion or extinction of certain chinook salmon stocks.

Other range-wide factors that affect indigenous west coast chinook stocks include introduced or artificially propagated hatchery stock, commercial harvest, alteration of estuarine habitat, and natural fluctuations in marine environments (NMFS 1998a, 1998b).

Spring chinook salmon that may be adversely affected by the proposed action, spawn and rear in the Wenatchee River and certain tributaries both up and downstream of Icicle Creek. The UCR spring chinook salmon ESU occupies the Columbia River Basin upstream from Rock Island Dam to the United States - Canada border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion. The Wenatchee and Entiat rivers are in the Northern Cascades Physiographic Province. The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Streamflow in this area is provided by melting snowpack, groundwater, and runoff from glaciers.

The proposed action would occur within designated critical habitat for the UCR spring chinook salmon. Defining specific river reaches that are critical for spring chinook salmon is difficult

because of the current low abundance of the species and our imperfect understanding of the species' freshwater distribution, both current and historical (65 Fed. Reg. 7764; February 16, 2000).

The NMFS' preferred approach to identifying the freshwater and estuarine portion of critical habitat is to designate all areas (and their adjacent riparian zones) accessible to the species within the range of each ESU (65 Fed. Reg. 7764; February 16, 2000). NMFS believes that adopting a more inclusive, watershed-based description of critical habitat is appropriate because it (1) recognizes the species' use of diverse habitats and underscores the need to account for all of the habitat types supporting the species' freshwater and estuarine life stages, from smaller headwater streams to migration corridors and estuarine rearing areas; (2) takes into account the natural variability in habitat use (e.g., some streams may have fish present only in years with plentiful rainfall) that makes precise mapping difficult; and (3) reinforces the important linkage between aquatic areas and adjacent riparian/upslope areas (65 Fed. Reg. 7764; February 16, 2000).

Essential features of spring chinook salmon critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space and safe passage conditions. Good summaries of the environmental factors that have contributed to the decline of spring chinook salmon and other salmonids can be found in reviews by Bjornn and Reiser, 1991; NMFS, 1996; NMFS 1998a and 1998b; and Spence et al., 1996.

Previous assessment of stocks within this ESU have identified several as being at risk or of concern. Nehlsen et al., (1991) identified six stocks as extinct. Washington Department of Fisheries et al., (1993) considered nine stocks within the ESU, of which eight were considered to be of native origin and predominantly natural production. The status of all nine stocks was considered depressed. Populations in this ESU have experienced record low returns for the last few years (65 Fed. Reg. 7764; February 16, 2000).

Recent total abundance of the UCR spring chinook salmon ESU is quite low, and escapements in 1994-1996 were the lowest in at least 60 years (65 Fed. Reg. 7764, February 16, 2000). At least six populations of spring chinook salmon in this ESU have become extirpated and almost all remaining naturally-spawning populations have fewer than 100 spawners (65 Fed. Reg., February 16, 2000). In addition to extremely small population sizes, both recent and long-term trends in abundance are downward, some extremely so. The Washington State Salmon and Steelhead Stock Inventory (SASSI, 1992) lists the Methow River spring chinook salmon stock as depressed, based on a long-term negative trend in escapement. Stock performance over the past decade would put them at the head of the "critical" class defined in the SASSI.

Spring chinook entering Icicle Creek are primarily adults returning to the Leavenworth National Fish Hatchery. The original Leavenworth stock was collected at Rock Island Dam (1940-1943) and supplemental eggs have been imported from other Columbia River hatcheries, mainly Carson, Cowlitz, and Little White Salmon National Fish Hatcheries (USFWS BA, 2001). The Leavenworth spring chinook stock is not listed under the ESA, however, wild strays that are

listed pursuant to the ESA may enter Icicle Creek. Wild spring chinook spawn in Nason Creek, and in the Chiwawa, Little Wenatchee, upper main Wenatchee, and White Rivers (Chapman et al., 1994 *as cited in* USFWS BA, 2001). Spring chinook also spawn in the lower Icicle. From 1989-1993 an average of 41 (range = 24-53) and from 1994-1999 an average of 14 (range = 6-33) spring chinook redds were counted in lower Icicle Creek below the hatchery (Mosey and Truscott 1999; Mosey pers. comm. *as cited in* USFWS BA, 2001). These naturally spawning spring chinook are thought to be of Leavenworth fish hatchery origin (Peven and Mosey 1996 *as cited in* USFWS BA, 2001).

2.1.2 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consulting regulations). The NMFS must determine whether the action is likely to jeopardize the listed and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NMFS must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life stages that occur beyond the action area. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' designated critical habitat. The NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both the survival and recovery of the listed species. The NMFS identifies those effects of the action that impair the function of any essential element of critical habitat. The NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will adversely modify critical habitat, it must identify any reasonable and prudent measures available.

Guidance for making determinations of jeopardy and adverse modification of habitat are contained in *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids,* August 1999. Although the proposed action affects certain biological requirements of listed salmonids, some of the effects of the proposed action are beneficial. This Opinion discusses the effects of the action in terms of the species' biological requirements rather than strictly implementing the analytic framework suggested in *The Habitat Approach*.

For the proposed action, NMFS' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. The NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for migration and spawning of the listed salmon under the existing environmental baseline.

2.1.2.1 Biological Requirements

The first step in the methods NMFS uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. The NMFS also considers the current status of the listed species; taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its original decision to list the species for protection under the ESA. Additionally, the assessment will consider any new information or data that are relevant to the determination.

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally reproducing population levels at which time protection under the ESA would be unnecessary. Species or ESUs not requiring ESA protection have the following attributes: population sizes large enough to maintain genetic diversity and heterogeneity, the ability to adapt to and survive environmental variation, and are self-sustaining in the natural environment.

The biological requirements for both the UCR steelhead and spring chinook include food (energy) source, flow regime, water quality, habitat structure, passage conditions (migratory access to and from potential spawning and rearing areas), and biotic interactions (Spence, et al., 1996).

2.1.2.2 Factors Affecting the Species at the Population Level

In other Biological Opinions, NMFS assessed life history, habitat and hydrology, hatchery influence, and population trends in analyzing the effects of the underlying action on affected species at the population scale (see, for example, Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin. NMFS 2000.) A thumbnail description of each of these factors is provided below.

2.1.2.2.1 UCR Steelhead

Life History

Juvenile steelhead in this ESU may remain in freshwater for 1-4 years before smoltification. Smoltification may be initiated by environmental factors such as photoperiod, water temperature, and water chemistry (Flomar and Dickhoff 1980; Wedemeyer *et al.* 1980). Steelhead remain in the ocean for 2-3 years, occasionally for 4 years (Shapolov and Taft 1954). All steelhead upstream of The Dalles Dam are summer-run (Schreck et al. 1986, Reisenbichler et al. 1992,

Chapman et al. 1994). A nonanadromous form co-occurs with the anadromous form in this ESU; information suggests that the two forms may not be isolated reproductively, except where barriers are involved.

Habitat and Hydrology

Habitat blockage now present in this ESU is at the Chief Joseph Dam on the Columbia River, but minor blockages occur throughout this ESU. Water withdrawals for agriculture and orchards and other domestic uses have significantly reduced late summer-early fall instream flows in the principal summer steelhead spawning and rearing tributaries, including the Wenatchee River and Icicle Creek. This is significant because high summer and low winter water temperatures are limiting factors for salmonids in many streams in this ESU.

Hatchery Influence

Evidence suggests that historically Icicle Creek produced wild steelhead (Brennan 1938, Fulton 1970, Mullan et al. 1992). The present population size of wild steelhead native to this creek is unknown. The Leavenworth National Fish Hatchery raised summer steelhead from 1940-1951 and from 1977-1995 with the last release in 1997. The brood stock for the program was collected at Rock Island Dam and in low return years, supplemental eggs from Wells State Fish hatchery were used. The program was ended at the Leavenworth hatchery and moved to the Winthrop National Fish Hatchery because of an inadequate water supply, low adult returns, and concern over using non-Wenatchee River stocks (USFWS 1998). Between 1978 and 1997, a total of 1,372,789 steelhead were released into Icicle Creek. Also, since 1982, the Washington Department of Fish and Wildlife has released 331,657 hatchery summer steelhead into Icicle Creek, and approximately 3.7 million into the Wenatchee River Basin. The percentage of wild steelhead in the adult returns to the Leavenworth National Fish Hatchery for the years 1987, ‘88, ‘91, and ‘93 averaged 21% (range = 4-41%) (USFWS 1998).

Population Trends and Risks

Trends in total (natural and hatchery) adult escapement are available for the Wenatchee River (2.6% annual increase, 1962-1993) and the Methow and Okanogan Rivers combined (12% annual decline, 1982-1993). These two stocks represent most of the escapement to natural spawning habitat within the range of the ESU (WDF *et al*, 1993).

Review of the most recent data indicates that natural steelhead abundance has declined or remained low and relatively constant in the major river basins in this ESU (Wenatchee, Methow, Okanogan) since the early 1990s. Estimates of natural production of steelhead in the ESU are well below replacement (approximately 0.3:1 adult replacement ratios estimated in the Wenatchee and Entiat Rivers)(62 Fed. Reg. 43949). These data indicate that natural steelhead populations in the upper Columbia River basin are not self-sustaining at the present time. There is anecdotal evidence that resident rainbow trout , which are in numerous streams throughout the

ESU, contribute to anadromous run abundance. This phenomenon would reduce estimates of the natural steelhead replacement ratio.

The proportion of hatchery fish is high in these rivers (65-80%). In addition, substantial genetic mixing of populations within this ESU has occurred, both historically (as a result of the Grand Coulee Fish Maintenance Project) and more recently as a result of the Wells Hatchery program. Extensive mixing of hatchery stocks throughout this ESU, along with the reduced opportunity for maintenance of locally adapted genetic lineages among different drainages, represents a considerable threat to steelhead in this region (62 Fed. Reg. 43950).

The primary cause for concern for steelhead in this ESU are the extremely low estimates of adult replacement ratios. The dramatic declines in natural run sizes and the inability of naturally spawning steelhead adults to replace themselves suggest that if present trends continue, this ESU will not be viable. Habitat degradation, juvenile and adult mortality in the hydrosystem, and unfavorable environmental conditions in both marine and freshwater habitats have contributed to the declines and represent risk factors for the future. In addition, harvest in lower river fisheries and genetic homogenization from composite broodstock collections are other factors that may contribute significantly to risk to the UCR ESU (62 Fed. Reg. 43950).

2.1.2.2.2 UCR Spring Chinook

Life History

Stream-type juvenile chinook salmon, which is characteristic of spring fish (Spence *et al* 1996), exhibit downstream dispersal and utilize a variety of freshwater rearing environments during their one to two years of freshwater rearing before migration to the ocean (Meehan and Bjornn 1991). As chinook salmon grow they move from shallow littoral habitats into deeper river channels and their prey base changes from shallow epibenthic prey to larger pelagic species (Allen and Hassler 1986). Stream-type life history strategies may be adapted to watersheds or parts of watersheds that are more productive and less susceptible to dramatic changes in water flow, because the long rearing period requires more stable less degraded habitats (Miller and Brannon 1982, Healey 1991). The range of ocean residence for chinook salmon is from 1-6 years. Stream-type chinook salmon tend to enter freshwater as immature or "bright" fish, migrate far upriver, and use upper watersheds for spawning in late summer and early autumn (Myers *et al.* 1998).

Habitat and Hydrology

Chief Joseph Dam on the Columbia River prevents spring chinook from accessing historical upstream habitats. There are local habitat problems related to irrigation diversions and hydropower development, as well as degraded instream and riparian habitat from urbanization and livestock grazing. Mainstem Columbia River hydroelectric development has resulted in a major disruption of migration corridors and affected flow regimes and estuarine habitat. Some populations in this ESU must migrate through nine mainstem dams.

Hatchery Influence

The Leavenworth National Fish Hatchery has raised spring chinook since 1940. The original Leavenworth stock was collected at Rock Island Dam (1940-1943) and supplemental eggs have been imported from other Columbia River hatcheries, mainly, Carson, Cowlitz, and Little White Salmon National Fish hatcheries. Since 1985, no eggs or fish have been imported to Leavenworth National Fish Hatchery (USFWS 1998). Leavenworth hatcheries' contribution to the Wenatchee sub-basin spring chinook run averaged 49% (range= 28.8-69%)(USFWS 1998).

The Leavenworth spring chinook stock is not listed under ESA, however, wild strays may enter Icicle Creek. Wild, UCR spring chinook spawn in Nason Creek, and in the Chiwawa, Little Wenatchee, upper main Wenatchee, and White Rivers (Chapman *et al.* 1994). Spring chinook also spawn in lower Icicle Creek. These naturally spawning spring chinook are thought to be of Leavenworth National Fish Hatchery origin (Peven and Mosey 1996).

Population Trends and Risks

Artificial propagation efforts have had a significant impact on spring-run populations in this ESU, either through hatchery-based enhancement or the extensive trapping and transportation activities associated with the Grand Coulee Fish Management Plan (GCFMP). Prior to the implementation of the GCFMP, spring-run chinook salmon populations in the Wenatchee, Entiat, and Methow Rivers were at severely depressed levels. Therefore, it is probable that the majority of returning spring-run adults trapped at Rock Island Dam for use in the GCFMP were probably not native to these three rivers (Chapman et al. 1995). All returning adults were either directly transported to river spawning sites or spawned in one of the National Fish Hatcheries (NFH) built for the GCFMP (63 Fed. Reg. 11497).

In the years following the GCFMP, several stocks were transferred to the NFHs in this area. Naturally spawning populations in tributaries upstream of hatchery release sites have apparently undergone limited introgression by hatchery stocks, based on coded wire tag recoveries and genetic analysis (Chapman et al. 1995). Artificial propagation efforts have recently focused on supplementing naturally spawning populations in this ESU, although these naturally spawning populations in this ESU were founded by the same GCFMP homogenized stock. Furthermore, the potential for hatchery-derived non-native stocks to genetically impact naturally spawning populations exists, especially given the recent low numbers of fish returning to rivers in this ESU. Risks associated with interactions between wild and hatchery chinook salmon are a concern, because there continues to be substantial production of the composite, non-native Carson stock for fishery enhancement and hydropower mitigation (63 Fed. Reg. 11497).

Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Nehlsen *et al*. (1991) identifed six stocks as extinct. WDF *et al*. (1993) considered nine stocks within the ESU, of which eight were considered to be of native origin and predominantly natural production. The status of all nine stocks was considered depressed. Populations in this ESU experienced record low returns for last few years (63 Fed. Reg. 11497).

Recent total abundance of this ESU is quite low, and escapements in 1994-1996 were the lowest in at least 60 years. Almost all remaining naturally-spawning populations have fewer than 100 spawners. In addition to extremely small population sizes, both recent and long-term trends in abundance are downward, some extremely so.

2.1.2.3 Factors Affecting the Species within the Action Area

Section 4(a)(1) of the ESA and NMFS listing regulations (50 C.F.R. § 424) set forth procedures for listing species. The Secretary of Commerce must determine, through the regulatory process, if a listed species is endangered or threatened based upon any one or a combination of the following factors; (1) the present or threatened destruction, modification, or curtailment if its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

The proposed action includes activities that would have some level of effects with the potential for long-term impacts from the first and fifth category. The characterization of these effects and a conclusion relating the effects to the continued existence of both UCR steelhead and spring chinook salmon are provided below, in section IV: Analysis of Effects. The major factors affecting steelhead and spring chinook salmon within the action area include instream flows, and channel conditions and dynamics.

2.1.2.4 Environmental Baseline

The environmental baseline represents the current basal set of conditions to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process." 50 C.F.R.§ 402.02. The term "action area" means "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." Id.

Critical habitat for both steelhead and spring chinook salmon includes the Wenatchee River and to all tributaries where anadromous fish range. Direct effects within the action area include the reach of Icicle Creek within the boundaries of the Leavenworth National Fish Hatchery, and extend to the 1998 restoration area at the left bank of the historic channel below Structure No. 5 near the confluence with the main channel. The precise downstream limit of the action area cannot be easily determined, because the extent of effects of the proposed action would vary according to flow stage.

Access to a substantial portion of historical habitat for both steelhead and spring chinook salmon was blocked by the construction of Chief Joseph and Grand Coulee Dams on the mainstem Columbia River. For both the UCR steelhead and spring chinook salmon ESUs, there are also

local habitat problems related to irrigation diversions, degraded riparian and instream habitat from urbanization, land conversion to crops and orchards, livestock grazing, and timber harvest (NMFS 1996a, 1996b, 1997, 1998a, 1998b).

The project area reach lies within the Icicle Creek watershed, the largest tributary watershed of the Wenatchee River, providing 20% of the low season flows (Wenatchee Watershed Ranking Report Addendum, Chelan County C.D. 1996, pg. 18 *as cited in the* Draft Salmonid Habitat Conditions chapter, WRIA 45, April 20, 2001). Icicle Creek originates high in the Cascade Mountains and drains an area of 214 square miles (136,960 acres; USFS 1995) in North Central Washington. Icicle Creek runs 31.8 river miles before emptying into the Wenatchee River at the City of Leavenworth.

Water use is a high demand resource in the watershed, with multiple small irrigators, two irrigation districts, and the Leavenworth National Fish Hatchery all drawing water from the watershed. The Leavenworth National Fish Hatchery diversion dam (RM 2.8) is a full fish passage barrier preventing access upstream to 24.5 miles of mainstem Icicle Creek habitat (Mullan et al.1992, USFS 1995, USFS 1998cc *as cited in* draft "Salmonid Habitat Conditions" chapter, WRIA 45, April 20, 2001).

The U.S. Forest Service (USFS) reports that about 4.5% of the drainage has been harvested (USFS Icicle Watershed Assessment, 1995). Private land development occurs in the lower reach of the watershed within the floodplain and riparian areas. This is primarily single family residences and roads (USFS 1995). The City of Leavenworth is located at the mouth of Icicle Creek, and the Icicle Creek Road parallels the creek from the mouth up to the USFS boundary (RM 17.5).

There have been numerous land use/land management related habitat impacts in the channel migration zone of lower Icicle Creek. Based upon analysis of aerial photographs, Chapman et al. (Status of Summer/Fall Chinook 1994, Appendix C *as cited in* draft "Salmonid Habitat Conditions" chapter, WRIA 45, April 20, 2001) found that 11.2% of Icicle Creek between RM 0.2 and 1.8 had no riparian vegetation. Portions of Icicle Creek Road and some USFS campgrounds impact the floodplain. Additionally, a substantial quantity of streambank along Icicle Creek Road has been altered with riprap.

The original design of the Leavenworth National Fish Hatchery involved diverting the majority of Icicle Creek's flow through the canal with an energy control dam at the base and construction of holding dams and weirs in the historic creek channel. These structures effectively block fish passage (at RM 2.8) to the upper Icicle and are no longer needed for hatchery operations. During several months of the year downstream fish passage to the lower Icicle may also be prevented by structures in the historic channel and little to no flow in the canal.

Two water diversions in Icicle Creek upstream from the hatchery at RM 4.5 and 5.7 may present fish passage barriers. The hatchery's intake (RM 4.5) blocks fish passage at low flows (USFWS 2001). There are also several natural fish passage obstacles in Icicle Creek upstream of the

hatchery. None of those have been proven to be year-round fish migration barriers (USFWS 2001).

Based on all the above information, NMFS concludes that not all of the biological requirements of the listed steelhead and spring chinook salmon for freshwater habitat in general are being met under the environmental baseline in this watershed. The status of the species is such that there must be significant improvement in the environmental conditions they experience, over those presently available under the environmental baseline, to meet the biological requirements for survival and recovery of the species. Further degradation of these conditions could significantly reduce the likelihood of survival and recovery of these species due to the amount of risk the listed steelhead and spring chinook salmon already face under the current environmental baseline.

2.1.3 Analysis of Effects

NMFS' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 C.F.R. § 402.02). "Indirect effects" are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur (*ibid*).

2.1.3.1 Direct Effects

The proposed action (collection of fish from the historic channel, historic channel flushing, and the construction of in-water structures) is likely to cause incidental take of juvenile steelhead and spring chinook salmon in the action area. Though neither spawning or the presence of redds has been documented in the project reach for either steelhead or spring chinook salmon, juveniles of both species are likely use the reach seasonally, for rearing habitat and/or refugia. Thus, it is reasonably certain that juvenile steelhead and/or spring chinook rearing in the action area will be harassed, displaced, and/or killed when seining, or if electrofishing is necessary, to remove fish from the historic channel reach, or when the historic creek channel is completely dewatered, or when certain construction work is conducted in the wetted channel.

The likelihood of incidental take will be minimized to a great extent by removing any fish remaining in the channel during the dewatering process. After flow is completely shut off from the historic channel, the channel will be snorkeled and walked to ensure no fish remain stranded. All captured fish will be released in the main Icicle Creek channel immediately downstream of the hatchery.

The removal of existing structures, the construction of the new structures, and the reconditioning of remaining existing structures in the historic Icicle Creek channel will be conducted in the dry. That work is not expected to directly affect fish.

Upon completion of work in the historic channel, the majority of instream flow will then be redirected through that reach, instead of the manmade hatchery canal. However, the channel restoration work completed in 1998 immediately downstream from the hatchery was designed to function with the majority of stream flow entering from the hatchery canal. That change in the direction of instream flow will require the installation of new instream barbs, J-hook veins, or vortex rock weirs to reduce stream bank shear stress and erosion. That work would be conducted in the wetted stream channel and may result in the take of juvenile steelhead and spring chinook that may be rearing in the project reach.

Additional bank protection structures (instream barbs, J-hook veins, or vortex rock weirs) would also be constructed on the north side of the historic channel (between Structures No. 4 and 5) to prevent increased stream flow from cutting a meander channel. If conducted in the wetted channel, this construction may also result in the take of juvenile steelhead and spring chinook salmon that may be rearing in the work area.

2.1.3.2 Indirect Effects

An indirect effect of the proposed action would be sediment flushing downstream from the historic channel. After work in the historic flow channel is completed, instream flow would be redirected through the historic channel, and an initial pulse of sediment would likely be transported downstream through the work reach. Additional sediment pulses or releases are likely to occur until when 2,620 cfs flow (the maximum flow quantity) is allowed through the channel.

Acute and sub-lethal effects of suspended sediment on fish species are variable. The ability of coho fingerlings to capture prey was reported to be reduced at suspended sediment concentrations of 300-400 mg/l (equivalent to ppm), while mortality occurs at concentrations greater than 20,000 mg/l (MacDonald et al. 1991, *as cited in* USFWS BA, December 18, 2001). Others have reported mortality of underyearling salmonids at concentrations of 1,200 mg/l (Nelson et al. 1991 *as cited in* USFWS BA, December 18, 2001). In a worst case scenario, if all of the sediment is flushed in one year (estimated at 1,164,072 cubic feet), by flows greater than 1,000 cfs, suspended sediment would only increase by 106 ppm (Emmett 1998 *as cited in* USFWS BA, December 18, 2001). Suspended sediment data collected in Icicle Creek by the Washington Dept. of Ecology indicates that for flows below 2,500 cfs, suspended sediment concentrations are generally well below 25 mg/l (ENSR 2000 *as cited in* USFWS BA, December 18, 2001). This information would suggest that, in a worst case scenario, suspended sediment as a result of flushing would increase by approximately 106 ppm. Though elevated above background levels, that short-term increase in suspended sediment is not expected to be of magnitude or duration that would result in the death of any salmonids. It may, however, injure fish by causing gill abrasion or by diminishing the ability of juvenile salmonids to forage or feed.

Even after modified natural flow scour occurs, sediment characteristics within the historic channel will not be fully restored because artificial structures will remain and instream flows will

be managed. Sediment will likely re-accumulate in the channel until an equilibrium is reached. In time, the historic channel will achieve an artificial equilibrium, with higher stored sediment levels than would be found under natural conditions (no management).

Implementing the proposed work would provide upstream and downstream fish passage through the Leavenworth National Fish Hatchery grounds. Fish passage would remain artificially impeded at Structures No. 2 and 5 during spring collection season and passage devices would be used. During the spring collection from May 1 to July 31, upstream fish passage would be provided through V-trap fishways and sorting facilities on the right and left banks of the historic channel at Structure No. 5 and a vertical slot fishway at Structure No. 2. Outside of spring collection season, the V-traps would be removed and upstream fish passage through Structure No. 5 would be unrestricted.

2.1.3.2.1 Indirect Effects on UCR Steelhead

Retaining Structures No. 2 and 5 and increasing the flows into the historic channel up to a maximum of 2,620 cfs would affect stream banks and riparian vegetation within the project reach. Flows through the historic channel would increase substantially from present conditions, likely causing some short-term erosion from around the remaining in-channel structures, combined with an initial pulse of residual sediment left from the channel modification work. That sediment pulse would be short in duration and intensity and would likely not be measurable downstream of the project reach (USFWS 2001). Thus, residual sediments and turbidity introduced into the water when flow is restored to the historic channel will not be expected to cause gill abrasion, or affect foraging or feeding behaviors of UCR steelhead.

During the spring collection season, when V-traps would be in place, upstream fish migration may be delayed and fish may be stressed by overcrowding and sorting at Structure No. 5 (USFWS 2001). Fish would be delayed from the time they enter the holding areas to the time they respond to the activation of the Denil ladder to the time they are released above Structure No. 5. Delaying migration affects spawning timing and causes abnormal energy expenditures which reduces reproductive success and can cause mortality either during migration or on spawning grounds (Powers and Osborne 1984 *as cited in* USFWS 2001). Sorting of fish would be done mechanically and would cause minimal stress to the fish (USFWS 2001). Overcrowding could occur in the holding areas which would stress fish. Stress plays a major role in the susceptibility of fish to disease and may result in immediate or delayed mortality (USFWS 2001).

The vertical slot fishway at the headgate portion of Structure No. 2 will self regulate flow and resist sediment accumulation. This fishway will be specifically designed to pass steelhead and bull trout.

Minimal downstream fish passage will be provided by vertical slot fishways (USFWS 2001). Instead, downstream fish passage will be provided year-round either through the headgate into the historic channel or the canal, by regulating the headgate opening height. Fish migrating

downstream through the headgate will exit the historic channel and Structure No. 5 through a V-trap picket weir during the hatchery's spring collection season (USFWS 2001). Juvenile fish moving downstream during the period when the pickets are deployed would be small enough to pass between the pickets (USFWS 2001). Though the V-trap picket weir deployment will coincide with spring runoff flows, use of the headgate to control flows in the historic channel (maximum 2,620 cfs) would help reduce the risk of fish impingement against the pickets. NMFS believes juvenile steelhead (year 0 - 1+ age class) that rear or migrate downstream in Icicle Creek will risk impingement against the pickets at high spring flows. Outside of the collection season the V-trap picket weir will be removed and downstream passage unhindered.

Immediately after project completion the quality and quantity of pool, overwintering, and rearing habitat in the historic channel should be improved for steelhead over present conditions. However, over the long-term (two or more years), the quality and quantity of pool habitat for steelhead may diminish as sediment will likely accrete in certain reaches of the historic channel because of controlled flow regimes and maintenance of in-channel structures. Fish habitat downstream from the hatchery could be affected by sediment flushed from the historic channel or by a change in stream dynamics caused by altered flow patterns.

The addition of bank barbs, J-hook vanes, or vortex rock weirs may minimally aid in the creation of pool and eddy habitat for juvenile steelhead that may rear in the project reach.

2.1.3.2.2 Indirect Effects on UCR Spring Chinook

Indirect effects on listed UCR spring chinook salmon from sediment releases after project completion would be the same as described above for steelhead.

The Leavenworth spring chinook stock is not listed under the ESA, although wild strays may enter Icicle Creek. Spring chinook do spawn in lower Icicle Creek. These naturally spawning fish are thought to be of Leavenworth National Fish Hatchery origin (Peven and Mosey 1996 *as cited in* USFWS 2001).

All spring chinook that enter the fishways at Structure No. 5 would be trapped and held. Those fish would be sorted and allowed continued passage upstream (for natural fish), or returned to the downstream pool and hatchery ladder entrance (for hatchery fish). Steep pass Denil style ladders with false weirs and sorting flumes will be installed for both the left and right bank fishways. Sorting will allow the release of non-hatchery fish to a bypass channel leading up to the historic channel. The frequency and duration of which this sorting will depend on the number of fish entering the fishway, the amount of stress and delay allowable for upstream migrating fish, and the rate at which the fish respond to the activation of the ladder (USFWS Icicle Creek Restoration Project DEIS, June 2001).

Immediately after project completion the quality and quantity of pool, overwintering, and rearing habitat in the historic channel should be improved for spring chinook salmon over present conditions. However, over the long-term, the quality and quantity of pool habitat for spring

chinook will likely diminish as sediment accretes in the historic channel because of controlled flow regimes and maintenance of in-channel structures. Fish habitat downstream from the hatchery could be affected by sediment flushed from the historic channel or by a change in stream dynamics caused by altered flow patterns.

The addition of bank barbs, J-hook vanes, or vortex rock weirs may minimally aid in the creation of pool and eddy habitat for juvenile spring chinook that may rear in the project reach.

2.1.3.3 Effects on Critical Habitat

The NMFS designates critical habitat for a listed species based upon physical and biological features that are essential to that species. Essential features of critical habitat for these two ESUs include substrate, water quality/quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. (65 Fed. Reg. 7764, February 16, 2000).

The direct and indirect effects discussed previously identify that the proposed action would modify critical habitat for both steelhead and spring chinook to a minor extent. The avenues in which critical habitat may be affected are disclosed in the MPI analysis; specifically in the Water Quality, Habitat Access, Habitat Elements, and Channel Conditions and Dynamics pathways. Within these pathways, most indicators will remain at risk over the long-term. The exception is the Habitat Access MPI indicator that will improve (restore) passage conditions in Icicle Creek for all listed salmonids through the hatchery grounds. Relating these indicators back to essential features of critical habitat, the primary impact of the proposed action will be a short-term increase in turbidity and suspended sediments (water quality) in and downstream of the work area. Habitat elements, channel conditions, and channel dynamics for both steelhead and spring chinook will also be expected to improve for the short-term within the project area. Those short-term habitat improvements will likely diminish as sediments re-accumulate in the project area and flows through the historic channel are controlled.

The NMFS believes that long-term benefits to essential features of critical habitat for both steelhead and spring chinook would include restoring passage through the hatchery grounds for all life stages of listed steelhead and spring chinook. The construction of barbs, J-hook vanes, or vortex rock weirs in the historic channel should create some long-term (greater than two years) eddy and pool habitat for rearing juvenile steelhead and spring chinook in the project reach to the extent that channel conditions (flow regimes and structural components) will be managed.

2.1.4 Cumulative Effects

Cumulative effects are defined as "those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." (50 C.F.R. § 402.2). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Gradual improvements in habitat conditions for salmonids are expected on federal lands as a result of Northwest Forest Plan implementation. Significant improvements in UCR steelhead and UCR spring chinook salmon production outside of the U.S. Forest Service and Bureau of Land Management lands is unlikely without changes in forestry, agriculture, and other practices occurring with non-federal watersheds. The NMFS is aware that significant efforts, such as the Draft Salmon, Steelhead and Bulltrout Habitat Limiting Factors Water Resource Inventory (April 2001), have been developed to improve conservation and restoration of steelhead and chinook salmon habitat on non-federal land. Local improvements to presently degraded habitat conditions might occur as a result of a proposed land acquisition by the Chelan-Douglas Land Trust at the confluence of Icicle Creek and the Wenatchee River.

NMFS assumes that future private and state actions will continue at similar intensities as in recent years. Now that the UCR steelhead and spring chinook salmon ESUs are listed under the ESA, NMFS assumes that non-federal landowners in those areas will also take steps to curtail or avoid land management practices that would result in the take of those species. Such actions are prohibited by section 9 of the ESA and subject to the incidental take permitting process under section 10 of the ESA. Future federal actions, including the on-going operation of hatcheries, harvest, and land management activities, will be reviewed through separate section 7 processes.

2.1.5 Conclusion

Access to a substantial portion of historical habitat for both steelhead and spring chinook salmon was blocked by the construction of Chief Joseph and Grand Coulee Dams on the mainstem Columbia River. Because of this reduction in access to historical habitat, and because of the relatively pristine habitat conditions in the upper watersheds of the Wenatchee Basin, accessible habitat in the Wenatchee Basin assumes a significance in the survival and recovery of these ESUs disproportionate to the amount of habitat in these watersheds. Consequently, NMFS must closely scrutinize land management actions in the basin that could significantly degrade this important habitat.

The applicant's proposal to flush sediments and restore streamflow to the historic Icicle Creek channel will improve passage conditions for listed salmonids, particularly steelhead and bulltrout. Any native spring chinook attempting to migrate through the hatchery grounds will be allowed to migrate upstream of the hatchery. In-channel structures will be installed to reduce bank erosion and provide cover and pool habitat for rearing salmonids. The long-term benefit (quality) of the habitat improvements to listed salmonids will be contingent upon the flow regimes directed through the historic channel and the accretion of sediments retained by the in-channel manmade structures. Thus, when compared against existing conditions, it is expected the proposed action will not appreciably reduce the likelihood of survival and recovery of the listed species.

The NMFS concludes that the proposed action will not jeopardize the continued existence of UCR steelhead or UCR spring chinook salmon or result in the destruction or adverse modification of critical habitat within the action area. The determination of no jeopardy or

adverse modification of critical habitat is based upon the current status of the species, the environmental baseline for the action area, and the effects of the proposed action.

2.1.6 Reinitiation of Consultation

Consultation must be reinitiated if (1) the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action (50 C.F.R. § 402.16).

2.2 INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, spawning, rearing, feeding, migrating, and sheltering (50 C.F.R. § 222.106; 64 Fed. Reg. 60727). Incidental take is take of listed animal species that results from, but is not the purpose of, the federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

2.2.1 Amount or Extent of Take

The NMFS anticipates that the action covered by this biological opinion may result in incidental take of listed species through direct harm, injury and /or death to juveniles from collecting fish (netting or electrofishing) prior to dredging the historic Icicle Creek channel and the installation of in-channel structures immediately downstream of the Leavenworth National Fish Hatchery. Take may also occur by temporarily displacing listed from the action area during the construction of in-channel structures immediately downstream of the hatchery. The NMFS also anticipates that take through indirect impacts may occur as elevated quantities of suspended sediments will be flushed downstream when instream flow is redirected to the historic channel. Any take from the proposed action would be minimized by the reasonable and prudent measures and terms and conditions. Effects of the action such as these are largely unquantifiable, but are not expected to be measurable as long-term effects on the species' habitat or population levels. The best scientific and commercial data available are not sufficient to enable NMFS to estimate a specific amount of incidental take to the listed species themselves. In instances such as this,

NMFS anticipates that an unquantifiable amount of incidental take could occur as a result of the action covered by this biological opinion.

2.2.2 Reasonable and Prudent Measures

The following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize take of the listed species. These RPMs are integrated into the BA and proposed project, and NMFS has included them here to provide further detail as to their implementation.

1. Incorporate best management practices (BMPs) to reduce potential impacts of equipment staging, bank erosion, and in-channel construction activities.

2. Safely remove listed juvenile fish from the work area prior to drying up the historic stream channel or conducting in-channel construction work.

3. Apply appropriate timing restrictions to minimize potential take.

2.2.3 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the USFWS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. Implement RPM #1 by conducting the following:

    a. All river flow will be diverted through the artificial hatchery channel so that structure removal and structural improvements in the historic channel reach will be conducted in the dry.

    b. A sealed walking excavator will be used for construction work conducted in wetted channel reaches.

    c. Equipment access will be via existing roads. No new roads will be constructed nor will any riparian vegetation be removed within the action area.

    d. A spill prevention, control, and containment plan will be implemented.

    e. Hydraulic fluid in heavy equipment will be replaced with mineral oil or other biodegradable, non-toxic hydraulic fluid.

    f. All heavy equipment will be clean and free of external oil, fuel, or other potential pollutants.

2. Implement RPM #2 by conducting the following:

    a. Incrementally reduce flow in the historic Icicle Creek channel to aid in the safe removal (snorkel, seine herd, capture, and electrofish if necessary) of juvenile fish prior to drying the channel. All fish removed from the historic channel will be safely transported for release back to Icicle Creek outside of the action area.

    b. Continue to monitor (walk or snorkel as necessary) the historic Icicle Creek channel after dewatering to ensure that juvenile fish are not stranded.

    c. No handling of juvenile fish will occur.

    d. In the event that steelhead or spring chinook salmon are killed or injured, the USFWS shall immediately report to NMFS, Washington State Habitat Branch, the circumstances under which take occurred and the measures immediately employed to preclude additional take.

3. Implement RPM #3 by conducting the following:

    a. All project work would be completed within one year of commencement.

    b. The use of Structures No. 2 and No. 5 and the seasonal installation of V-shaped pickets to collect fish in the historic channel during spring shall not delay or stress native steelhead or native spring chinook nor hinder or prevent them from migrating upstream through the hatchery grounds. After spring adult collection is completed the V-shaped pickets will be removed from the creek channel.

2.2.4 Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop additional information.

The NMFS would encourage USFWS to minimize to the extent practicable the use of water diverted from Icicle Creek for hatchery operations. This would help conserve surface water in Icicle Creek necessary for all life stages of listed fish residing in the creek, aid in restoring riparian conditions, and help restore floodplain conditions. NMFS also recommends that USFWS minimizes the reliance on manmade instream structures used to pass/preclude fish passage through the hatchery grounds. Those artificial structures preclude natural channel forming processes, such as flow regimes, sediment transport, substrate deposition, and large woody debris recruitment, and create the need for long-term maintenance commitments.

The NMFS must be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed species or their habitat. Accordingly, NMFS requests notification of the implementation of any conservation recommendations.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- federal agencies must consult with NMFS on all actions, proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§ 305(b)(2));

- NMFS shall provide conservation recommendations for any federal or state activity that may adversely affect EFH (§ 305(b)(4)(A));

- Federal agencies shall within 30 days after receiving conservation recommendations from NMFS provide a detailed response in writing to NMFS regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NMFS, the Federal agency shall explain its reasons for not following the recommendations (§ 305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including the individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH consultation with NMFS is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse impacts to EFH.

3.2 Identification of EFH

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable manmade barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

3.3 Proposed Actions

The proposed actions and action area are detailed above in the Background, Description of the Proposed Project, and Environmental Baseline sections of this BO. The action area includes habitats that have been designated as EFH for various life-history stages of chinook and coho salmon.

3.4 Effects of Proposed Action

As described in detail in section 2.3 of this BO, the proposed action may result in short- and long-term adverse effects to a variety of habitat parameters. These adverse effects are: 1) temporary increases in turbidity; 2) construction of in-channel structures that will, over time, promote sediment accretion in the project dredging area; 3) controlled flows in the historic Icicle Creek channel that will limit natural channel shaping processes; and, 4) the potential for polluting surface waters by spills and/or leaks from construction equipment during project implementation.

3.5 Conclusion

NMFS believes that the proposed action may adversely impact designated EFH for chinook and coho salmon.

3.6 EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations to federal agencies regarding actions which may adversely affect EFH. While NMFS understands that the conservation measures described in the BO will be implemented by the USFWS, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. However, Terms and Conditions 1a-1f, in Section 2.6.3 of this BO are adequate to address these adverse impacts to the maximum extent practicable. Consequently, NMFS recommends that they be adopted as EFH conservation measures. If implemented by the USFWS, these measures will minimize the potential impacts of the proposed project and conserve EFH.

3.7 Statutory Response Requirement

Pursuant to MSA (§305(b)(4)(B)) and 50 CFR 600.920(j), federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of its receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

The USFWS must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(k)).

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